BACnet IP (Annex J) Device Driver Guide

Table of Contents

1. Summary - BwBACnetJ driver

There are multiple ways to implement the BACnet protocol. This document describes BACnet using the Internet Protocol stack (sometimes called BACnet IP). This driver complies with the J Annex of the BACnet standard; hence, the name, BACnetJ, for the driver.

To implement this driver you will need:

BACnetJ device driver from Broadwin.
These consist of BwBACnetJ#.dll located in drive:\Webaccess\Node\
And BwBacDrvJ.dll in drive:\Webaccess\Node\driver

WebAccess Version 7 candidate dated **Sept 23 2009 or later** or the BwBACnetJ.DLL and BwBACnetJ#.dll dated Sept 17 2009, or later.

BACnet Browser
WebAccess does not have a 'Self-Discovery" feature that will allow you to browse devices and tags. The object instance number is used as the tag's address in WebAccess; this is easily determined from a BACnet browser, usually supplied by the BACnet equipment manufacturer, but also from third party companies (for example Cimmetrics). The Cimmetrics BACnet Explorer (the purchased version or demo version) or Cimmetrics OPC Server (the demo version works great) can provide you with the Instance Number of each device, the Object Type (AI, AO, AV, BI. BO BV, etc) and Instance Number for each tag that you want to read. But don't install these on the SCADA node, they will interfere with WebAccess SCADA node communications to the BACnet devices.

> *Warning – The Cimmetrics BACstac runs as a service and will interfere with (intercept) BACnet communications with the Webaccess SCADA node software. It is recommended to not install Cimmetrics BACnet browser on the SCADA node (use another PC instead). You should uninstall the Cimmetric BACstac from the SCADA node. Similarly you should uninstall any other communications service that would intercept the BACnet communications. And you can not run another BACnet communications program while the SCADA node is running; they will interfere with each other.*

IP Address and UDP Port used by the BACnet Device(s).

The steps to implement this BACnetJ driver, in brief, are:

1. Ensure the BwBacDrvJ.dll is located in drive:\Webaccess\Node\driver and that BwBACnetJ#.dll is located in drive:\Webaccess\Node\. If not, obtain them from Broadwin and copy them to drive:\Webaccess\Node\driver on the Project Node and drive:\Webaccess\Node\driver on the SCADA node.
2. Uninstall or disable any other BACnet communications services on the SCADA node computer.
3. Create a Project, Node in Project Manager

4. Create a TCP/IP Port on SCADA node
5. Create a BACnetJ Device. There are two methods to address a BACnet Device:
    a. For a pure BACnet IP device with no MSTP connection to the device.
    b. For a device on an MSTP (serial) network connected to a Ethernet/IP Gateway
6. For a pure BACnet IP device configure the:
    a. **IP Address** of the Device
    b. The **UDP Port** used by the BACnet protocol (typically 47808).
    c. The **Device Instance Number**. *(You may need to use the BACnet browser, on a second PC, to discover the Instance Number)*.
    d. The **Max Read Property** (0 = Read 70 tags each poll, 1= Read 1 tag per poll, 2= Read 2 tags each poll, etc.).
7. For a an MSTP device connected to a BACnet IP gateway configure the:
    a. **IP Address** of the Device
    b. The **UDP Port** used by the BACnet protocol (typically 47808).
    c. The **Device Address** using the format **NetworkNumber.MACaddress** *(You may need to use the BACnet browser, on a second PC, to discover the Network number and MAC address)*. The mac address is in decimal (not Hex).
    d. Leave Device instance number as 0.
    e. The **Max Read Property** (0 = Read 70 tags each poll, 1= Read 1 tag per poll, 2= Read 2 tags each poll, etc.).
8. Use the BACnet browser (on another PC) to browse tags and discover their name, object type and Instance Number.
9. Create Tags that match the Object Type, Instance Number and the object-identifier that you want to read and/or write (typically 85)

1.1.1   Tag Address

The BACnetJ device driver in WebAccess uses a simple address scheme, Object Type Number.Instance Number. Object-Identifier Number

Analog Inputs are 0.InstanceNo.85 (for example, the address of the first instance of an AI is 0.1.85)

Analog Outputs are 1.InstanceNo.85 (for example the address is 1.1.85)

Analog Values are 2.InstanceNo.85 (for example, address: 2.1.85)

Binary Inputs are 3.InstanceNo.85 (for example, address: 0.1.85)

Binary Outputs are 4.InstanceNo.85 (for example, address: 1.1.85)

Binary Values are 5.InstanceNo.85 (for example, address: 2.1.85)

If there are multiple BACnet devices, it is recommended to configure unique instance numbers for the objects. (For example 1.70001.85, 1.80001.85, etc.) Having the object instance number repeatedly used in multiple devices (for example all devices having an object 1.1.85) can give false readings.

To read the Present Value of Tags, some examples of Addresses are:

Tag	Address
AI_1	0.1.85
AI_2	0.2.85
AI_3	0.3.85
AI_4	0.4.85
AO_1	1.1.85
AO_2	1.2.85
AO_3	1.3.85
AO_4	1.4.85
AV_1	2.1.85
AV_2	2.2.85
AV_3	2.3.85
AV_4	2.4.85
BI_1	3.1.85
BI_2	3.2.85
BI_3	3.3.85
BI_4	3.4.85
BO_1	4.1.85
BO_2	4.2.85
BO_3	4.3.85
BO_4	4.4.85
BV_1	5.1.85
BV_2	5.2.85
BV_3	5.3.85
BO_4	5.4.85

2. Example: BACnetJ

This is an Example using the Delta Controls VAV Air controller and an Aleron IP/MSTP gateway/bridge.

WebAccess SCADA Node
↑
Internet Protocol
↓
Alerton BCM-ETH
↑
Serial MSTP
↑
Delta VAV controllers
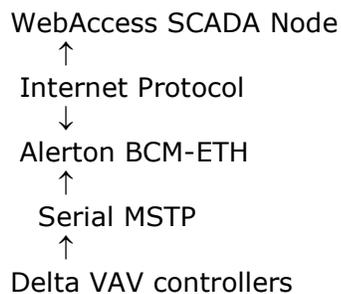
2.1 Use a BACnet Browser to get device Instance Numbers

Most manufacturers provide a BACnet browser or configuration tool. You should run it on another PC (not the SCADA node) to discover instance number of the Device and tags.

The Cimmetrics BACnet browser example below uses the Global Broadcast Who Is to discover the devices.
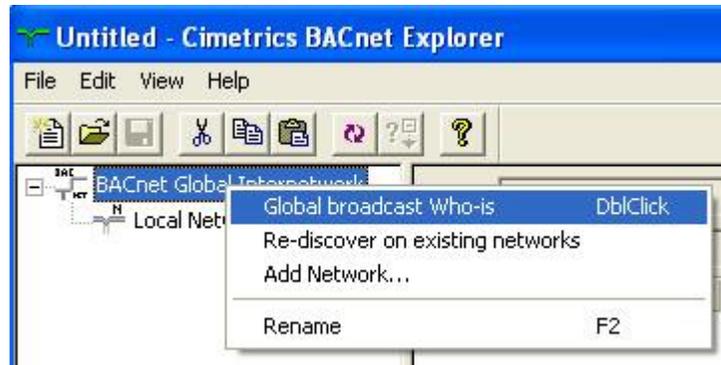
Figure - BACnet browser discovering devices with Global Broadcast Who-is
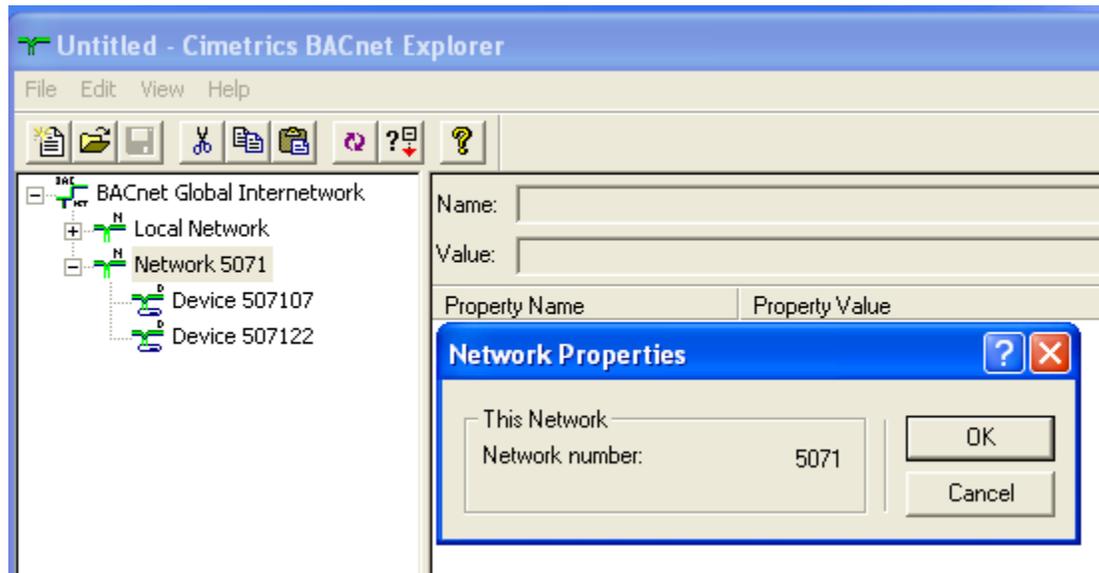
Figure - BACnet browser reading properties of IP Gateway with Device Instance Number of the Gateway and the Network number of the connected MSTP devices. (5071)
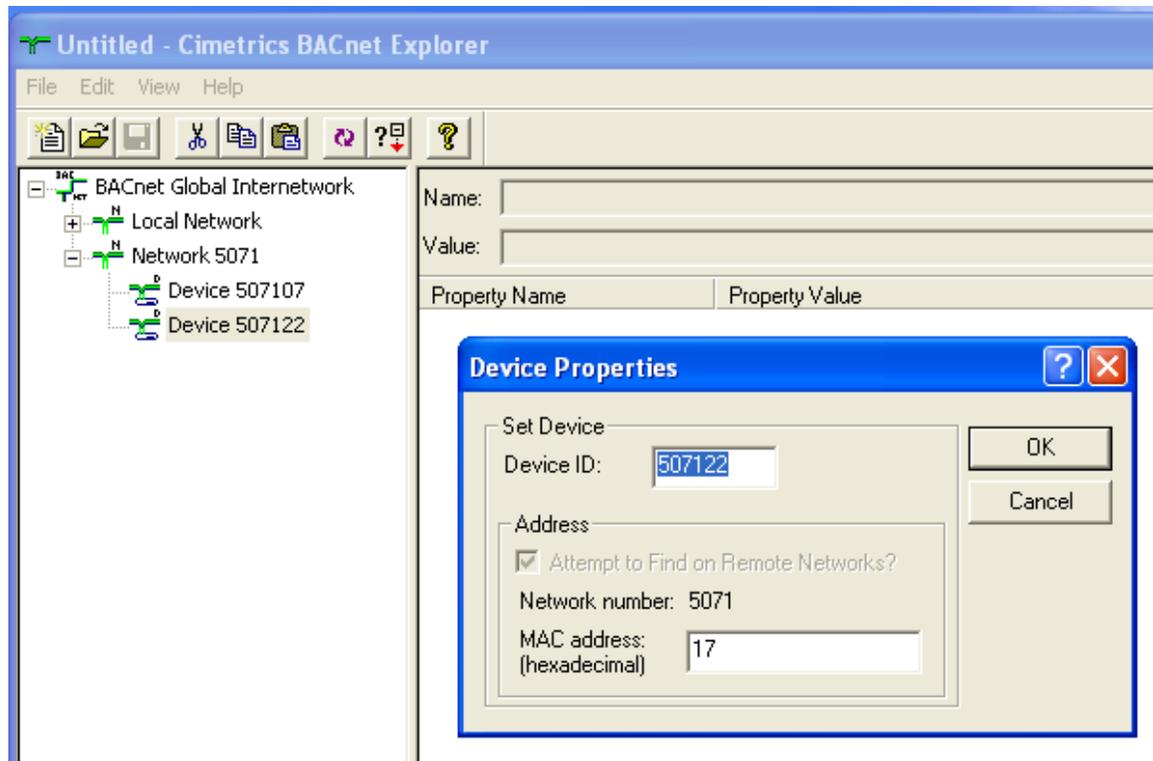
Figure – Bacnet Explorer reading properties of MSTP device to see MAC address (here in Hex, but web access uses decimal 17 Hex = 23 decimal).

Note that WebAccess expects the Device Instance Number, Network Number and MAC address in decimal. An convenient tool to convert Hexadecimal to Decimal is the Calculator in windows. Select View -> Scientific. Select the HEX button. Enter the number. Select the DEC button to convert the HEX number to Decimal.

2.2   Configure TCP/IP Port on SCADA node

The SCADA node needs use an IP address with the same subnet of the BACnet Gateway or device, if the BACnet Gateway uses a Private or Local Area network. (which maybe different than IP address used by clients to access the SCADA node). The SCADA node can have multiple IP networks assigned to a single NIC (for example a Public IP like 67.94.27.177 and a local LAN (private IP) like 192.168.1.177). You assign this in the Microsoft Windows Local Area Connections Properties using the Advanced button.
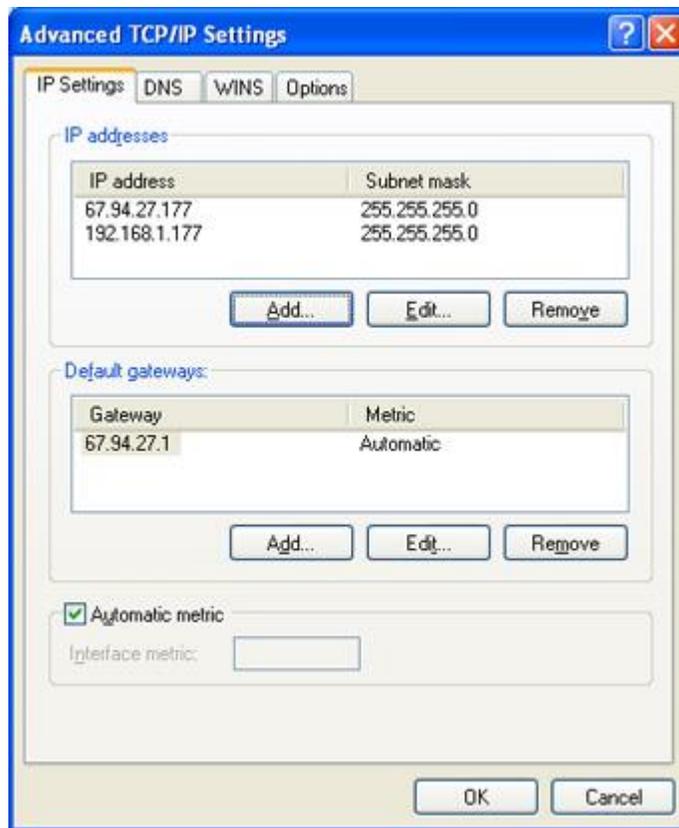
Windows Local Area Connections Properties - Advanced

Ensure there are no other BACnet communications services running. While your are in the Local Area Connections, look for other BACnet Communications services and un-install them. Some Network Monitors will also interfere with BACnet communications and should be uninstalled. If the SCADA node fails to communicate, you should come back an un-install these Network monitors as well.
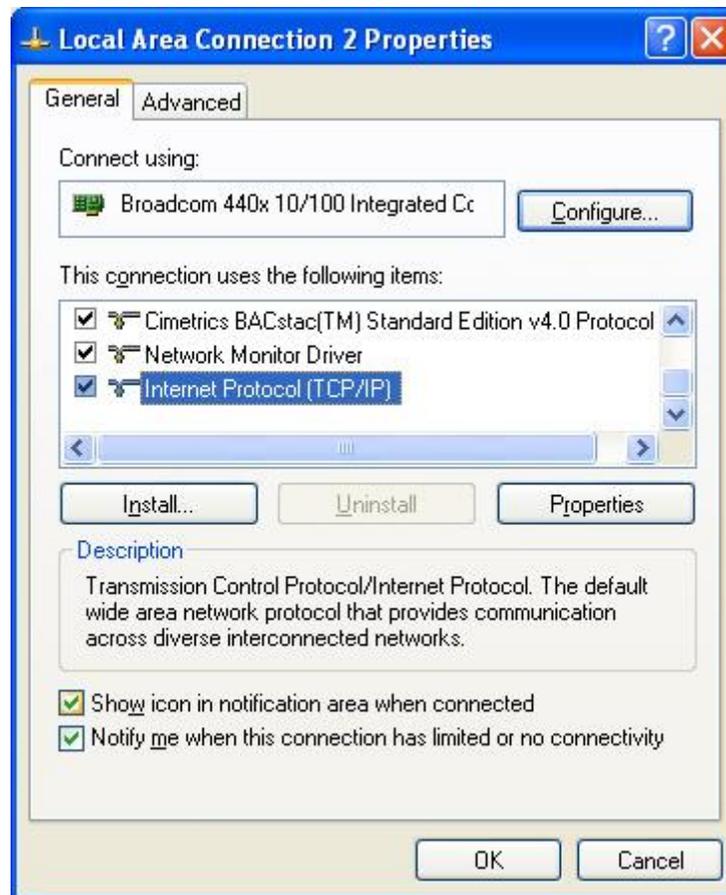
The Cimetrics BACstac will interfere with WebAccess
BACnet communications and should be removed!

2.3 Configure TCP/IP Port in WebAccess Project Manager

In the WebAccess Project Manager create a TCP/IP Communications Port on the SCADA node.
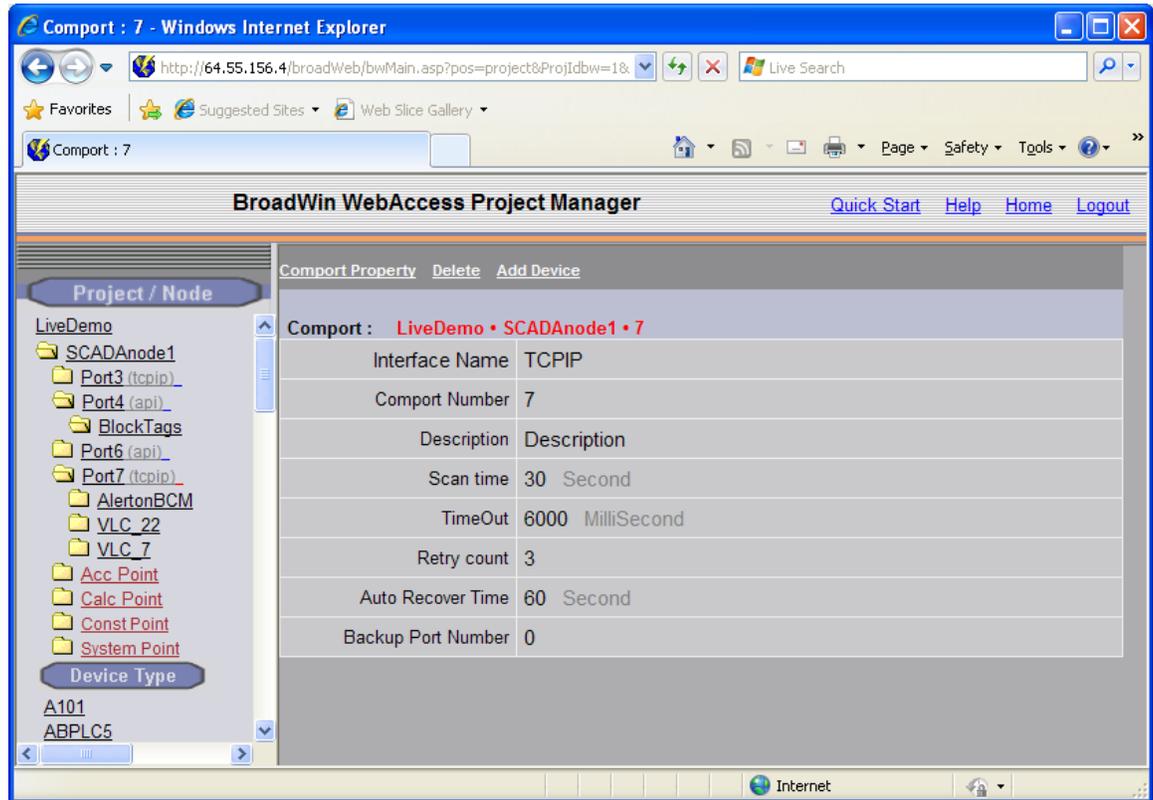
Note that an MSTP (serial device) may require longer TimeOut and slower scan than a pure BACnet IP device.

2.4 Create a pure BACnet IP Device in WebAccess
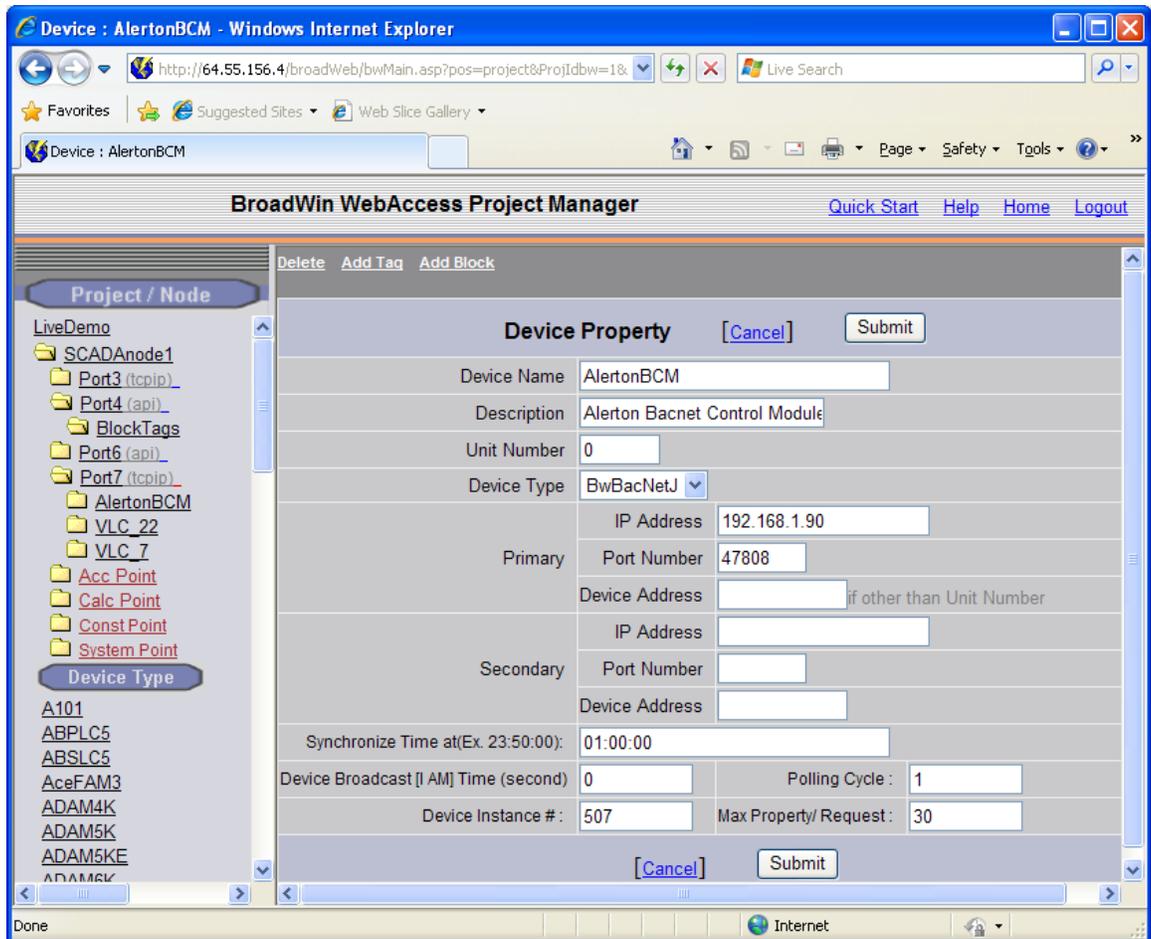
Figure – Device Property of BACnet Gateway

For a pure BACnet IP device configure the:

    a. **IP Address** of the Device

    b. The **UDP Port** used by the BACnet protocol (typically 47808).

    c. Leave the Device Address blank.

    d. The **Device Instance Number**. *(You may need to use the BACnet browser, on a second PC, to discover the Instance Number)*.

    e. The **Max Read Property** (0 = Read 70 tags each poll, 1= Read 1 tag per poll, 2= Read 2 tags each poll, etc.). Typically an MSTP device is limited to a small number of bytes. An Alerton VLC 550 controller can only respond with a message of 128 bytes, which corresponds to about 7 or 8 tags. An Alerton Gateway can respond with 1460 bytes, which corresponds to about 30 tags. Unfortunately, WebAccess uses a deterministic request size based generated at download. So, you will probably have to experiment with your devices to determine the Max Read Property size (in tag count).

    f. Optionally configure **the Synchronize Time** to some other time of Day.

g. If COV (Change of Value) reporting is enabled in the device, configure the **Device broadcast I AM** to the frequency the device transmits it's I AM. COV means the device responds only when there is a change of value and the I AM is used to mark the device as good. If use I AM broadcast, and the I AM message is not received within the period, the device will be marked as failed.
If you are not using COV, then leave I AM Time = 0.

h. Optionally change the **Polling cycle**. Polling Cycle = 1 means the device is polled at the Scan time. Polling Cycle =2 means the device is polled at 2*scan time. Polling Cycle essentially slows down how often a device is polled, allow other devices to be polled more frequently.

2.5 Create a MSTP BACnet Device in WebAccess

If there are MSTP devices connected to the BACnet IP device, create these using the BACnet IP Gateway's IP address, but the NetworkNumber.MACaddress in the Device Address. Leave the Device Instance number blank.
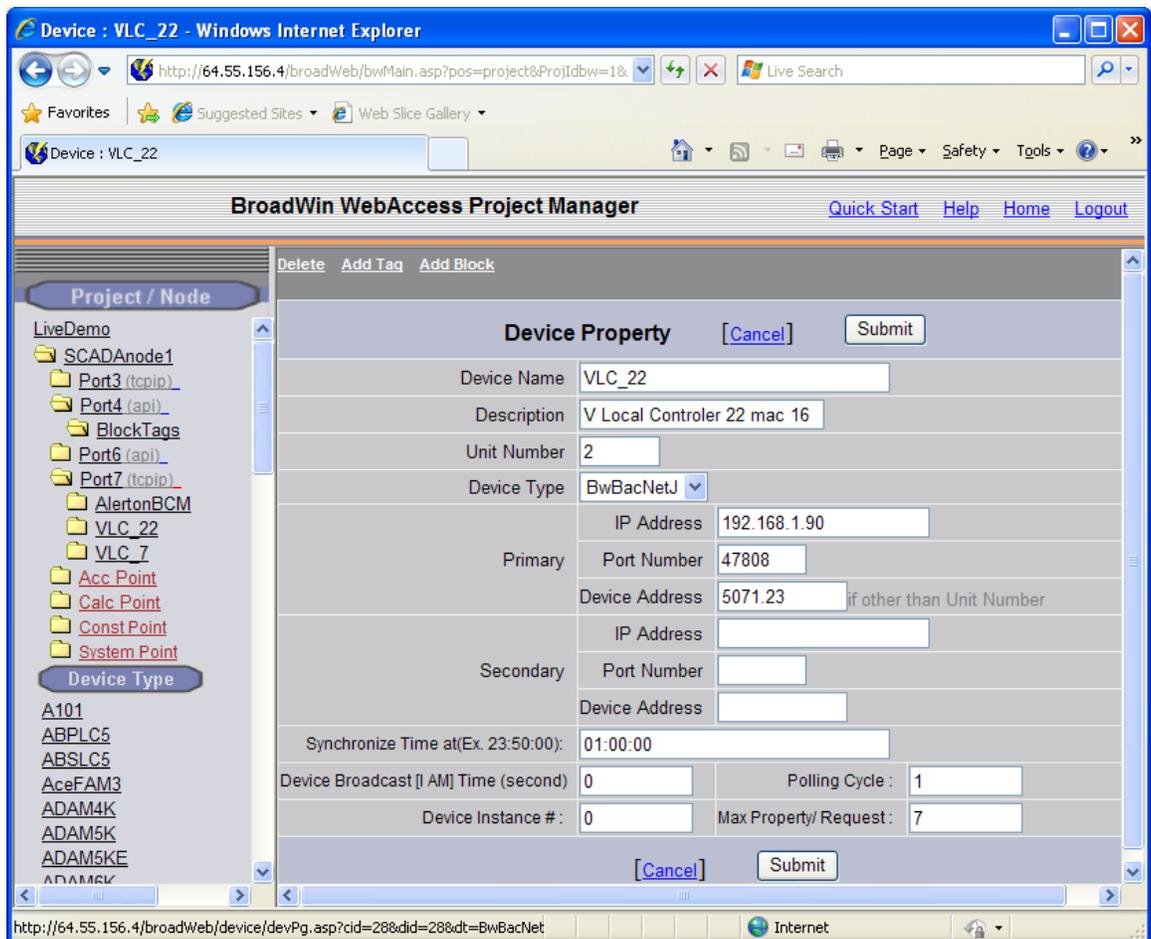
For a an MSTP device connected to a BACnet IP gateway configure the:

a. **IP Address** of the Device

b. The **UDP Port** used by the BACnet protocol (typically 47808).

c. The **Device Address** using the format **NetworkNumber.MACaddress** *(You may need to use the BACnet browser, on a second PC, to discover the Network number and MAC address*). The mac address is in decimal (not Hex). This MAC address is often set using toggle/dip switches on the MSTP device. Note that the MAC Address and device instance number are not always the same.

d. Leave **Device instance** number as 0.

e. Typically an MSTP device is limited to a small number of bytes. An Alerton VLC 550 controller can only respond with a message of 128 bytes, which corresponds to about 7 or 8 tags. An Alerton Gateway can respond with 1460 bytes, which corresponds to about 30 tags. Unfortunately, WebAccess uses a deterministic request size based generated at download. So, you will probably have to experiment with your devices to determine the Max Read Property size (in tag count).

f. Optionally configure **the Synchronize Time** to some other time of Day.

g. If COV (Change of Value) reporting is enabled in the device, configure the **Device broadcast I AM** to the frequency the device transmits it's I AM. COV means the device responds only when there is a change of value and the I AM is used to mark the device as good. If use I AM broadcast, and the I AM message is not received within the period, the device will be marked as failed.
If you are not using COV, then leave I AM Time = 0.

h. Optionally change the **Polling cycle**. Polling Cycle = 1 means the device is polled at the Scan time. Polling Cycle =2 means the device is polled at 2*scan time. Polling Cycle essentially slows down how often a device is polled, allow other devices to be polled more frequently.

2.6 Create Tags in BACnetJ Device

There are at least 6 parameters in the BACnetJ driver, AI, AO, AV, BI, BO, and BV. These correspond to the most commonly read "present value" of properties in BACnet devices.

1. Select a parameter type that matches the property you are to read.

2. Enter a tag name.

3. Modify the address to include the instance number of the property (i.e. change 0.InstanceNo.85 to 0.1.85).